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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/618,431	07/18/2000	Siu Chung Tam	A33341	9438

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EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 02/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/618,431	Applicant(s) TAM ET AL.	
	Examiner Johannes P Mondt	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 November 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,9-11 and 14-16* is/are rejected.

7)☒ Claim(s) *6-8 and 12-13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

Amendment A filed 12/20/2002 and entered as Paper No. 8 forms the basis of this office action. In Amendment A Applicant amended claim 1 and claims 2-13 to remove the objections to claim 1 and claims 2-13 formulated in Paper No. 6 (non-final rejection). Said objections are herewith withdrawn. Applicant also has successfully overcome the rejections under U.S.C. §112, first paragraph, through amendment of claim 6, taking into account also his Remarks in said Amendment A. Comments on the Remarks by Applicant on the art rejections can be found below under "Response to Arguments".

Response to Arguments

1. Applicant's arguments filed 12/20/2002 have been fully considered but they are not persuasive. In particular, although the objections to claim 1 and claims 2-13 and the rejection under U.S.C. §112, first paragraph, have been overcome by said Amendment A, the art rejections must be maintained for the following reasons:

(a) Rejection under U.S.C. § 102(e) of claims 1-2 and 14 as being anticipated by Sartorius et al (6,215,805):

Applicant states the Q-switch by Sartorius et al to provide variable outputs actively; however, as is clear from the abstract, the device by Sartorius consists of "at least one continually pumped active medium [that is the laser medium itself; examiner comment], and two optically coupled resonators at least one of which is passive [hence

inter alia exclusively passive optically coupled resonators; examiner comment]". Therefore, Sartorius et al teach inter alia a semiconductor passive Q-switch.

Therefore, said rejection under 102(e) of claims 1-2 and 14 must be maintained.

(b) Rejection under § 103(a) of claims 1-4, 9, 11 and 14-16 as being unpatentable over Meissner et al (6,160,824) in view of Birnbaum et al (5,832,008):

Applicant states that the "host material of Birnbaum et al includes ZnSe, ZnO, chalcogenides, etc., but there is no semiconductor material". However, ZnSe and some zinc chalcogenides are semiconductors (see Birnbaum et al, column 2, lines 16-27). This point can also be easily verified through any standard handbook or encyclopedia. The undoped nature only enters the present claim language through claim 10.

Therefore, said rejection under 103(a) of claims 1-4, 9, 11 and 14-16 must be maintained at this time.

(c) All other art rejections, i.e., of claim 5 under U.S.C. § 103(a), claim 10 under U.S.C. § 103(a), and

(d) the objection to claims 7, 8 and 12 and of claim 13 as being dependent upon a rejected base claim are at most traversed solely on the basis of the traverse of the underlying independent claims.

Therefore, said art rejections of claim 5 and of claim 10, and said objection to claims 7, 8 12 and 13 must at this time be maintained.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. ***Claims 1-2 and 14*** are rejected under 35 U.S.C. 102(e) as being anticipated by Sartorius et al (6,215,805).

With regard to claim 1: Sartorius et al teach a semiconductor passive Q-switch (cf. title and abstract) providing variable outputs (cf. abstract, second and third sentence; column 5, lines 59-61; column 6, lines 26-49; Figure 5) for use in a laser system to produce laser pulses having defined output characteristics including a lasing wavelength (cf. column 5, lines 58-59), said semiconductor passive Q-switch including variable transmittance means at the lasing wavelength (cf. column 6, lines 7-25 and Figure 4; column 6, lines 27-49 and Figure 5) for tuning said output characteristics of said laser pulses.

With regard to claim 2: said output characteristics of the semiconductor passive Q-switch taught by Sartorius et al include pulse duration and repetition rate (cf. column

6, lines 50-55) as well as peak power and averaged output power (the two are related through the pulse duration and repetition rate) (cf. column 6, lines 27-49 and column 6, lines 50-55) of said laser pulses.

With regard to claim 14: Sartorius et al teach a laser system incorporating a semiconductor passive Q-switch wherein said laser system includes a laser that is diode-side pumped or diode-end-pumped (cf. column 5, lines 23-37) (depending on whether one calls the diode boundaries abutting the cladding layers sides or ends).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. ***Claims 1-4, 9, 11, and 14-16*** are rejected under 35 U.S.C. 301(a) as being unpatentable over Meissner et al (6,160,824) in view of Birnbaum et al (5,832,008).

With regard to claim 1: Meissner et al teach a passive Q-switch 25 (cf. column 10, line 19, column 11, lines 8-12, and cf. column 19, lines 25-30) providing variable outputs for use in a laser system (to provide variable outputs in the form of laser pulses from laser input is the essence of a Q-switch) to produce laser pulses having defined output characteristics including a lasing wavelength (e.g., claim 43 by Meissner et al), said Q-switch including variable transmittance means at the lasing wavelength for tuning said output characteristics of said laser pulses (inherent in a passive Q-switch is

that the transmittance of the Q-switch is a function of its optical state). Although said passive Q-switch 25 is stated in general terms to require a laserable gain medium 22 sandwiched between cladding layers 24 and be formed of a variety of materials (cf. column 10, lines 2-9), it is standard knowledge in the field of solid-state lasers that semiconductor media serve the above-cited requirement, as witnessed by Birnbaum et al, who teach a passive Q-switch based on semiconductor materials (cf. title and abstract). Replacement of the laserable gain medium in Meissner by the laserable gain medium by Birnbaum would capitalize inter alia on lower thermal loads and faster Q-switch bleaching (cf. abstract). Said replacement would not alter other aspects of the invention by Meissner et al, who explicitly state quite general material requirements for their laserable medium, as cited above, and therefore, the implementation of the improvement taught by Birnbaum et al can be reasonably expected to be successful.

With regard to claim 2: inherently, output characteristics of a Q-switch include pulse duration, pulse repetition rate, peak power, and averaged output power of the laser pulses.

With regard to claim 3: the variable transmittance means of the semiconductor passive Q-switch taught by Meissner et al includes a wafer having two surfaces that are optically polished with one or both surfaces optically coated (cf. column 9, lines 56-62) to form a gradient variation of transmission (by virtue of the graded reflectivity coating causing a gradient in reflectivity; see column 12, lines 33-40) at a wavelength of 1.03 μm (cf. column 4, line 25), which is in the infrared (IR) part of the spectrum.

With regard to claim 4: said surfaces in the semiconductor passive Q-switch taught by Meissner et al are optically coated as a result of which a gradient variation of transmission is formed (cf. column 9, lines 56-62) at a wavelength in the IR region (cf. column 4, line 25).

With regard to claim 9: the semiconductor passive Q-switch 25 as taught by Meissner et al also functions as output coupler through its end 23 (cf. column 12, lines 53-57).

With regard to claim 11: The semiconductor material (transition metal group II-VI semiconductor) taught by Birnbaum et al for their passive Q-switch is selected inter alia because of its saturable absorption in the IR spectrum (cf. title, abstract).

With regard to claim 14: the passive Q-switch taught by Meissner et al is part of a laser system that incorporates it (cf. abstract and column 19, lines 25-30), said laser system including a solid-state laser (cf. "Field of Invention", column 1, lines 5-8) that is diode-end-pumped or diode-side-pumped (cf. column 5, lines 23-37) (depending on whether one calls the diode boundaries abutting the cladding layers sides or ends).

With regard to claim 15: the laser system incorporating the semiconductor passive Q-switch as essentially taught by Meissner et al and Birnbaum et al is indeed adapted to produce laser output at a wavelength centered at an IR wavelength (1.03 μm) (cf. column 4, line 25).

With regard to claim 16: although said wavelength in the laser system as essentially taught by Meissner et al and Birnbaum et al is different from 1.06 μm by about 3%, namely 1.03 μm (cf. column 4, line 25), said difference falls within what can

be considered matters of determining an optimum range or optimum value (in a narrow range). Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

5. ***Claim 5*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al (6,160,824) and Birnbaum et al as applied to claim 1 above, or, in the alternative, over Meissner et al (6,160,824) and Birnbaum as applied to claim 1 above, in view of Hubler et al (5,015,353). As detailed above, claim 1 is unpatentable over Meissner et al in view of Birnbaum et al. Meissner et al, nor Birnbaum et al, necessarily teach the further limitation of claim 5. However, it is understood by those of ordinary skills in the art that coatings with graded reflectivity can be made either by grading the composition or by grading the thickness, while in the former case the optical thickness of at least one component said coatings must necessarily be graded. In both cases, therefore, the coating would include material having a variable thickness; while, in the alternative, Hubler et al, likewise in semiconductor device art, teaches a grading of an index of refraction to be effected through variation of its thickness (N.B.: for the relation between the index of refraction and either the reflectivity or the transmittance see standard text books on the relation (Kramers-Kronig relation) between the real and imaginary parts of the dielectric permittivity, such as L.D. Landau and E. M. Lifschitz, "Electrodynamics of Continuous Media", ISBN 0-08-009105-9, paragraph 62, pp. 256-262, in the English translation reprinted 1981). Motivation to improve the prescription for the device

invented by Meissner through the inclusion of the teaching by Hubler et al in this regard is found in the relative ease with which coatings can be varied in thickness, while the inventions can be combined with reasonable expectation of success on the basis of this relative ease.

6. ***Claim 10*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al and Birnbaum et al as applied to claim 1 above, and further in view of Young (ISBN 0-387-16127-9). Although Meissner et al nor Birnbaum et al necessarily teach the laserable medium of the passive Q-switch to include undoped GaAs, it is standard knowledge in the field of semiconductor lasers that undoped GaAs ranks prominently among the possible embodiments of the laserable medium that are most readily implemented, as witnessed by the text book by Young (see Table 7.1 on page 170 and discussion on pages 170-171; note the citation of 840 nm both in the table and text). The examiner furthermore takes official notice that GaAs is particularly desirable because of its properties with regard to radiation damage. Motivation stems at least from the relative simplicity of implementation and also from the known resilience against radiation damage (of GaAs). Combination of the inventions is straightforward, considering the experience with GaAs as a medium, while the material choice does not affect any other aspect of the invention by Meissner et al. Success in implementing the teaching by Young can thus be reasonably expected.

Allowable Subject Matter

7. ***Claims 6-8*** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the tuning in the semiconductor passive Q-switch taught by either Meissner et al or Sartorius et al is not explicitly stated to be effected by translating the passive Q-switch in a direction perpendicular to the optical axis of the laser system or, - unlike the case of active Q-switches, moving the passive Q-switch itself in a curvilinear path such as rotating said passive Q-switch. Nor has this variable transmittance means been found in the prior art for the case of a semiconductor passive Q-switch. In prior art Fox et al (4,868,834), for instance, said prior art involving tuning of laser light in a configuration in which a Q-switch is instrumental the Q-switch has a trigger circuit, hence is not active, and the rotation is extraneous to the Q-switch.

8. ***Claim 12*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: neither InP nor AlGaAs has been in the prior art as material included in the

semiconductor material of the semiconductor passive Q-switch as defined by the independent claim 1.

9. ***Claim 13*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: multiple quantum well structures, although known in the art of semiconductor lasers, have not been found in the prior art as components in passive Q-switches. The MQW taught by Lam et al (5,005,176), for instance, is not part of a passive, but instead of an active Q-switch scenario.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
February 18, 2003

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800